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TECHNICAL REPORT R-3 78-7

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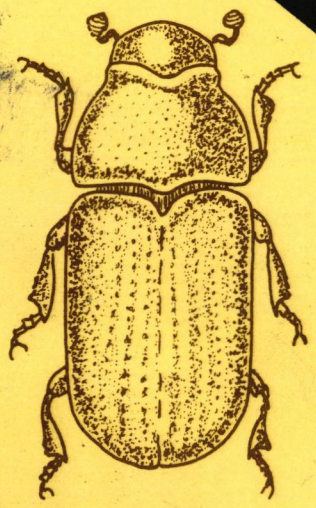
PHASE I. TWO-STORIED STANDS, 1977

Region 3

January 1978



Southwestern Region

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INTRODUCTION

Southwestern dwarf mistletoe (Arceuthobium vaginatum subsp. cryptopodum) is the most destructive forest disease in the Southwest. This disease causes growth loss, mortality, deformity, and reduced seed production in heavily-infected trees. Timber volume yield is reduced proportionate to the level of mistletoe infestation in a stand. Volume loss in an infested stand is 10-40 percent or more over a rotation. Silvicultural control of dwarf mistletoe is the most efficient method of reducing adverse effects caused by this disease. Removal of mistletoe-infected trees during precommercial and commercial thinning operations is an efficient way to suppress a dwarf mistletoe infestation.

Timber volume loss resulting from a dwarf mistletoe infestation is difficult to assess by direct observation. The effectiveness of silvicultural treatments that reduce mistletoe levels is variable. Researchers have developed a simulated yield program (SWYLD2) that will aid land managers in resolving these problems (Myers, Edminster, and Hawksworth 1976). The SWYLD2 program is designed for use in even-aged or two-storied stands of ponderosa pine. Stands may be either dwarf mistletoe-infested or non-infested. Yield tables generated by the SWYLD2 program help the land manager evaluate management alternatives through examination of simulated yields produced under selected options.

The SWYLD2 program is being implemented as a timber management tool in the Southwestern Region. Areas were selected in various parts of the Region for development of simulated yield tables in mistletoe-infested stands. The program for implementation of SWYLD2 consists of three phases: I. Development of yield tables for selected stands infested with dwarf mistletoe, II. Evaluation of these stands managed with the aid of SWYLD2 simulations, and III. Implementation of SWYLD2 as a tool in developing timber management programs in mistletoe-infested stands in Region 3. This report summarizes 1977 progress in Phase I of the SWYLD2 implementation program.

OBJECTIVE AND SCOPE

The purpose of this project was to continue developing simulated yield tables for two-storied, dwarf mistletoe-infested ponderosa pine stands on Ranger Districts throughout the Region. In 1977, Forest Insect and Disease Management personnel completed Phase I work on the following Districts: Alpine and Heber Ranger Districts, Apache-Sitgreaves National Forest; El Rito and Penasco Ranger Districts, Carson National Forest; Mt. Taylor Ranger District, Cibola National Forest; North Kaibab and Williams Ranger Districts, Kaibab National Forest.

PROCEDURE

The following procedure constituted Phase I of the SWYLD2 implementation program in 1977:

1. Collect data necessary for input in the SWYLD2 program from two-storied, dwarf mistletoe-infested ponderosa pine stands.

2. Process field data through the SWSUMMARY data summarization program.

3. Combine summary data with various management alternatives selected by the land manager and produce simulated yield tables for sampled areas.

4. Assist the land manager in interpreting yield tables and selecting the best combination of management alternatives in dwarf mistletoe-infested stands.

5. Assist the land manager in planning implementation of selected management alternatives.

METHODS

Areas of two-storied ponderosa pine infested with dwarf mistletoe were sampled by personnel from the Forest Insect and Disease Management Staff Unit. Ranger District personnel assisted with survey work in several areas.

Sampling Procedure

1. The stand was located and delineated on a map and/or aerial photos.

2. A road log was made from the Ranger District to the survey area.

3. Age and height measurements were taken on a specified number of dominant ponderosa pine trees for determination of site index in each area. Number of trees sampled varied with size of the area.

4. Age and height measurements were taken on a specified number of codominant or dominant ponderosa pine trees in each story for determination of average age and height. Number of trees sampled varied with size of the area.

5. Sample points were located on a 10X10-chain grid pattern throughout the area; a .01 or .02-acre* (depending on tree density) circular plot was established at each sample point; presence or absence of dwarf mistletoe and d.b.h. were recorded for all live trees $\geq$ 4.5 feet tall and $<$ 6.0 inches d.b.h.; at the same sample point, a 10 or 20 BAF* (depending on tree density) variable-size plot was established; the same variables as in the fixed plot were recorded for live trees $\geq$ 6.0 inches d.b.h.; data were recorded on automatic data processing forms.

6. Survey data were processed through the SWSUMMARY computer program. This program provided per-acre estimates by 1-inch diameter classes for number of trees, basal area, and percent trees infected with dwarf mistletoe. Site index, average d.b.h., average height, and growing stock level were calculated for each story. Summarized data were combined with management alternatives and processed through the simulated yield program SWYLD2.

7. Instructions for use of the SWSUMMARY program and the sampling procedure are available from FIDM.

RESULTS AND DISCUSSION

Personnel from Forest Insect and Disease Management completed Phase I surveys on seven Ranger Districts in four National Forests. In total, 9,770 acres of ponderosa pine were surveyed in 12 stands. A summary of stand conditions for all areas surveyed is provided in Figure 1. Due to the large number of areas sampled, only data from the Colter #2 stand on Apache-Sitgreaves National Forest will be discussed. For the other 11 stands, data produced have been provided to and discussed with personnel of the appropriate Ranger District.

A 1,270-acre area of two-storied ponderosa pine was sampled on Alpine Ranger District, Apache-Sitgreaves National Forest. Data were collected from 127 plots. Due to variation in stand conditions, the area was divided into two management stands (i.e., Colter #1 and #2, Figure 1). Plot and dwarf mistletoe distribution for each stand are indicated in Figure 2. Infected plots had at least one dwarf mistletoe-infected sample tree.

Information from the 600-acre Colter #2 stand will be used to illustrate development of simulated yield tables. Data from the Colter #2 stand was processed through the SWSUMMARY program using the demand mode (Appendix I, A-1 through A-7). Prior to running the program, a data file was constructed (A-1) and general information input was supplied (A-2). Output of SWSUMMARY included average site index (A-3), average age and height for codominants and dominants in the overstory and

* Only one plot size and BAF is used for each stand - these remain constant throughout a stand survey.

diameter classes (A-5 and A-6, respectively), and a summary of overstory was combined with various management alternatives to produce 12 sets (set = one overstory and one understory printout) of SWYLD2 simulated yield tables.

Because overstory management alternatives were held constant, only one overstory simulation is presented. About 40 percent of the overstory basal area was removed now, with the remainder being carried for 20 years to final removal (Table 1). Dwarf mistletoe (DMR) was reduced in the initial cut, but increased in the 20-year period before final removal. Spread of dwarf mistletoe from infected residual overstory trees to understory is simulated for the period before final overstory removal (Tables 1-7). The SWYLD2 program converts percent trees infected with dwarf mistletoe to a stand DMR, based on the 6-class rating system. Stand DMR reflects the average mistletoe rating for all trees in a sampled area.

All understory simulations were made for a 100-year period. The regeneration scheme was constant, with a 2-cut shelterwood method being used. Cuts were simulated at age 120 (50% of BA removed) and 150 (final removal). Three growing stock levels (GSL) were simulated for the initial thinning (70,80,90), while all subsequent intermediate cuts were made to GSL 80 (Tables 2-7). Thinning from above in the initial stand entry (Tables 2,4, and 6) was compared to thinning from below (Tables 3,5, and 7) for the three GSL combinations. A 20-year delay before the initial stand entry and a 20-year cutting cycle were simulated in all yield tables.

Simulating a GSL combination of 70-80, the initial thinning from below (Table 3) resulted in a higher overall yield than thinning from above (Table 2). The opposite result was obtained at GSL combinations of 80-80 and 90-80 (Tables 4-7). The 20-year delay before initial stand entry resulted in a buildup of dwarf mistletoe which could not be controlled by subsequent stand entries (Tables 2-7). Substantial reduction in total board foot yield (Tables 5 and 7) was caused by buildup of dwarf mistletoe and subsequent bypass of the intermediate cut scheduled at age 110.

The SWYLD2 program will not execute an intermediate cut when the DMR equals or exceeds 3.0. A DMR of 3.0 indicates about 86 percent of the trees are infected and a regeneration cut should be scheduled.

Dwarf mistletoe must be controlled in each stand entry to obtain maximum volume production in an infested stand. Simulated yield tables generated by the SWYLD2 program will aid land managers in selecting the combination of management alternatives that best meet current management objectives.

Sufficient stand data were obtained on seven Ranger Districts for use in the simulated yield program SWYLD2. Data were combined with various management alternatives, and yield tables were produced for sampled areas. Examination of yield tables revealed two important factors: (1) the effectiveness of dwarf mistletoe control is dependent on management alternatives selected for use in a particular area: (2) total volume production per acre is dependent on management alternatives, particularly initial and subsequent GSL's, selected for use in a particular area.

The simulated yield program is useful tool for land managers. The limits of the program will be revealed after on-the-ground situations, in which simulated yield information has been applied, are compared with post-treatment simulated yields (Phase II). Based on results of 1977 Phase I work, the following plan of action is recommended for sampled areas:

1. Select the yield table and accompanying management alternatives that best meet current management objectives, while reducing dwarf mistletoe to acceptable levels (FSM 5260).

2. Implement management alternatives selected for the first stand entry in the overstory and understory.

3. With the assistance of personnel from the Forest Insect and Disease Management Staff Unit, complete a post-treatment evaluation of the area.

4. Compare results of the post-treatment evaluation with simulated yield predictions (Phase II).

The growing stock levels used to generate yield tables for stands considered in this report are not intended as "best" growing stock levels for widespread use; however, they demonstrate the need for case-by-case selection of a suitable level based on the manager's objectives in conjunction with mistletoe management.

Instructions for use of the SWYLD2 program and detailed descriptions of management alternatives are provided by Edminster and Hawksworth (1976). Additional information on the SWYLD2 program, relative to dwarf mistletoe management, may be obtained by contacting Forest Insect and Disease Management. For general information on the SWYLD2 program, contact the Forest Insect and Disease Management or Timber Management Staff Unit.

LITERATURE CITED

Edminster, C. B., and F. G. Hawksworth, 1976. User's guide to SWYLD2: Yield tables for even-aged and two-storied stands of southwestern ponderosa pine, including effects of dwarf mistletoe. USDA, Forest Service, Gen. Tech. Rep. RM-23. 8 pp.

Myers, C. A., C. B. Edminster, and F. G., Hawksworth. 1976. SWYLD2: Yield tables for even-aged and two-storied stands of southwestern ponderosa pine, including effects of dwarf mistletoe. USDA, Forest Service, Res. Pap. RM-163. 25 pp.

National Forest Ranger District Stand & Acreage	Site Index	Average age		Average height		Average d.b.h.		No. Trees/ Acre		GSL/ Acre		% Dwarf Mistletoe Infected	
		OS	US	OS	US	OS	US	OS	US	OS	US	OS	US
Apache-Sitgreaves Alpine RD * Colter #1 670 acres 1	77	115	56	77	35	15.1	2.9	55	848	68	138	59	32
Apache-Sitgreaves Alpine RD * Colter #2 600 acres	76	128	50	82	31	15.9	3.9	41	325	55	64	33	10
Apache-Sitgreaves Heber RD 2 Pinto * 660 acres	76	101	58	73	38	16.1	3.5	52	664	73	121	22	10
Carson El Rito RD 3 Vallecitos 520 acres	64	108	53	62	27	13.9	2.5	40	551	42	82	16	2
Carson Penasco RD #1 510 acres 4	68	99	47	64	20	16.2	2.6	41	1,461	58	227	12	12
Carson Penasco RD #2 150 acres	43	119	45	52	18	14.5	2.8	8	1,929	9	310	32	45
Cibola Mt. Taylor RD 1 Copperton 680 acres	57	118	50	57	22	16.4	4.4	16	366	24	78	30	8
Kaibab North Kaibab RD North Saddle #1 960 acres 6	72	140	38	83	24	20.1	3.6	41	138	92	26	16	6
Kaibab North Kaibab RD North Saddle #2 4,100 acres	73	148	35	87	20	21.6	3.6	31	165	78	31	3	1
Kaibab Williams RD ** 7 #1 170 acres	59	88	48	50	21	13.1	4.1	44	235	23	47	33	55
Kaibab Williams RD * 8 #2 270 acres	69	74	52	55	27	13.1	6.2	69	88	64	25	11	12
Kaibab Williams RD * 9 #3 480 acres	67	70	54	51	23	12.7	4.9	76	249	67	57	6	1

OS = 12" and > d.b.h.
US = < 12" d.b.h.

*OS = 9" and > d.b.h.
US = < 9" d.b.h.

**OS = 10" and > d.b.h.
US = < 10" d.b.h.

Figure 1.

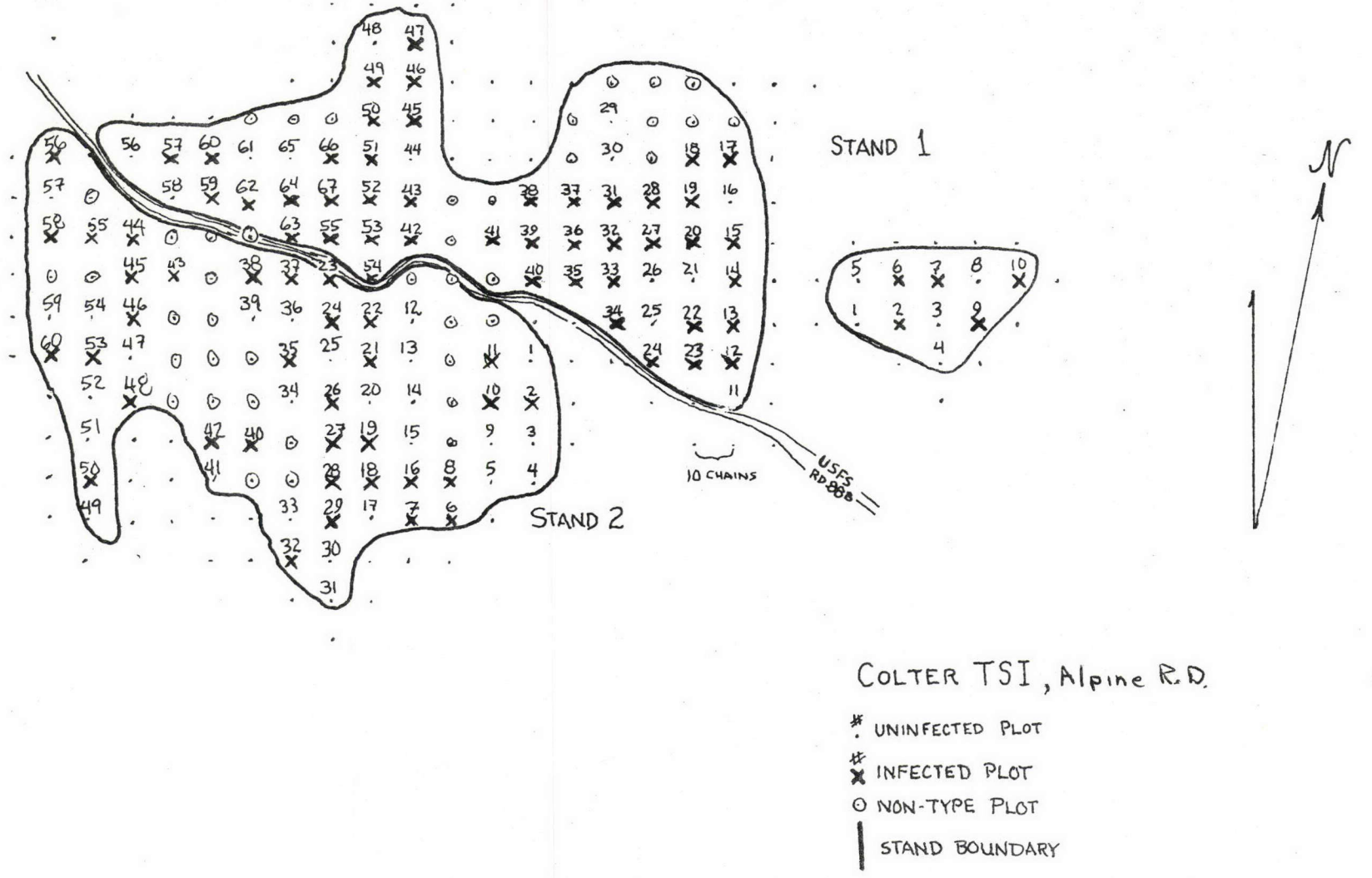
STAND 1
STAND 2
10 CHAINS
USFS RD 888
N
COLTER TSI, Alpine R.D.
UNINFECTED PLOT
INFECTED PLOT
NON-TYPE PLOT
STAND BOUNDARY

Figure 2

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 2., OVERSTORY.

SITE INDEX 76
THINNING INTENSITY-- INITIAL= 55. SUBSEQUENT= 55.

COLTER-STAND 2

CHARACTERISTICS BEFORE AND AFTER THINNING									PERIODIC INTERMEDIATE CUTS				
STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
128	.4	41	57	15.9	82	1750	1670	7200					
128	.0+	21	33	16.9	83	1030	980	4400	20	24	720	690	2800
138	.2	21	38	18.3	86	1250	1200	5700					
148	.2	21	44	19.5	88	1460	1410	7100					
								TOTAL YIELDS			2180	2100	9900

MERCH. CU. FT. = TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
BD. FT. = TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.
INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.
DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED = 3.0.
MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.
ALL THINNINGS MAY BE NONCOMMERCIAL.
AT INITIAL AGE 128., 33. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 1

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 2,, UNDERSTORY.

SITE INDEX 70
THINNING INTENSITY-- INITIAL- 70, SUBSEQUENT- 80,

COLTER-STAND 2

			CHARACTERISTICS BEFORE AND AFTER THINNING						PERIODIC INTERMEDIATE CUTS				
STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANT-ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANT-ABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
50	.2	325	27	3.9	31	450	0	0					
60	.6	322	47	5.2	38	770	230	0					
70	1.0	317	66	6.2	45	1160	640	0					
70	.4	245	47	5.9	44	800	380	0	72	19	360	260	0
80	.8	244	73	7.4	50	1330	1000	0					
90	1.2	243	98	8.6	55	1910	1620	1400					
90	.7	179	77	8.9	56	1510	1300	1300	64	21	400	320	100
100	1.2	178	97	10.0	60	2100	1870	3900					
110	2.0	166	110	11.0	64	2560	2330	7200					
110	1.5	115	80	11.3	64	1890	1730	5700	51	30	670	600	1500
120	2.3	106	89	12.4	68	2230	2060	7600					
120	1.4	38	40	13.9	69	1040	970	3800	68	49	1190	1090	3800
130	2.0	36	47	15.5	72	1280	1220	5200					
140	2.6	33	52	17.0	75	1470	1410	6400					
150	3.2	30	56	18.5	77	1640	1580	7600					
							TOTAL YIELDS				4260	3850	13000

MERCH. CU. FT. = TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
BD. FT. = TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.
INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.
DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED = 3.0.
MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.
ALL THINNINGS MAY BE NONCOMMERCIAL.
AT INITIAL AGE 50,, 10. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 2

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 2,, UNDERSTORY,

SITE INDEX 76
THINNING INTENSITY-- INITIAL- 70, SUBSEQUENT- 80,

COLTER-STAND 2

		CHARACTERISTICS BEFORE AND AFTER THINNING							PERIODIC INTERMEDIATE CUTS				
STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
50	.2	325	27	3.9	31	450	0	0					
60	.6	322	47	5.2	38	770	230	0					
70	1.0	317	66	6.2	45	1160	640	0					
70	.5	232	53	6.5	46	930	580	0	85	13	230	60	0
80	1.0	231	79	7.9	52	1460	1170	0					
90	1.4	230	102	9.0	57	2020	1750	2100					
90	.9	166	78	9.3	57	1560	1370	1900	64	24	460	380	200
100	1.3	165	97	10.4	62	2180	1970	4800					
110	2.1	153	108	11.4	65	2610	2390	8300					
110	1.7	107	80	11.7	66	1940	1780	6300	46	28	670	610	2000
120	2.5	98	88	12.8	69	2260	2100	7800					
120	1.6	36	40	14.3	71	1060	1000	4000	62	48	1200	1100	3800
130	2.2	34	47	15.9	74	1300	1240	5400					
140	2.8	31	52	17.5	76	1500	1440	6600					
150	3.3	28	55	19.0	79	1650	1590	7800					
							TOTAL YIELDS				4210	3740	13800

MERCH. CU. FT. = TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
BD. FT. = TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.
INITIAL THINNING MUST BE FROM BELOW.
DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED = 3.0.
MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.
ALL THINNINGS MAY BE NONCOMMERCIAL.
AT INITIAL AGE 50,, 10. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 3

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 2., UNDERSTORY.

SITE INDEX 76
THINNING INTENSITY-- INITIAL- 80. SUBSEQUENT- 80.

COLTER-STAND 2

CHARACTERISTICS BEFORE AND AFTER THINNING									PERIODIC INTERMEDIATE CUTS				
STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
50	.2	325	27	3.9	31	450	0	0					
60	.6	322	47	5.2	38	770	230	0					
70	1.0	317	66	6.2	45	1160	640	0					
70	.5	266	52	6.0	44	900	450	0	51	14	260	190	0
80	.9	264	79	7.4	50	1440	1090	0					
90	1.3	262	103	8.5	55	2020	1700	1300					
90	.8	182	77	8.8	56	1510	1300	1200	80	26	510	400	100
100	1.2	181	97	9.9	60	2100	1870	3700					
110	2.0	168	109	10.9	64	2550	2320	6900					
110	1.6	117	80	11.2	65	1890	1730	5500	51	29	660	590	1400
120	2.4	108	89	12.3	68	2240	2080	7600					
120	1.4	39	41	13.8	70	1050	980	3900	69	48	1190	1100	3700
130	2.1	37	48	15.4	72	1300	1240	5200					
140	2.7	34	53	16.9	75	1500	1440	6500					
150	3.3	30	55	18.4	77	1630	1570	7500					
						TOTAL YIELDS					4250	3850	12700

MERCH. CU. FT. = TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
BD. FT. = TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.
INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.
DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED = 3.0.
MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.
ALL THINNINGS MAY BE NONCOMMERCIAL.
AT INITIAL AGE 50., 10. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 4

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 2,, UNDERSTORY,

SITE INDEX 76
THINNING INTENSITY-- INITIAL- 80, SUBSEQUENT- 80,

COLTER-STAND 2

		CHARACTERISTICS BEFORE AND AFTER THINNING							PERIODIC INTERMEDIATE CUTS				
STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
50	.2	325	27	3.9	31	450	0	0					
60	.6	322	47	5.2	38	770	230	0					
70	1.0	317	66	6.2	45	1160	640	0					
70	.6	270	60	6.4	45	1050	630	0	47	6	110	10	0
80	1.1	268	87	7.7	51	1610	1260	0					
90	1.9	249	105	8.8	56	2090	1790	1800					
90	1.4	172	78	9.1	57	1550	1350	1600	77	27	540	440	200
100	2.3	158	90	10.2	61	1990	1790	4000					
110	3.1	140	98	11.3	65	2340	2140	7100					
110	3.1	140	98	11.3	65	2340	2140	7100	0	0	0	0	0
120	3.9	119	98	12.3	68	2500	2310	8400					
120	2.8	37	40	14.0	70	1040	980	3900	82	58	1460	1330	4500
130	3.4	33	44	15.6	73	1210	1150	4900					
140	4.0	28	45	17.2	76	1300	1240	5700					
150	4.6	23	44	18.7	78	1300	1250	6100					
							TOTAL YIELDS				3410	3030	10800

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
BD. FT. - TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.
INITIAL THINNING MUST BE FROM BELOW.
DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.
MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.
ALL THINNINGS MAY BE NONCOMMERCIAL.
AT INITIAL AGE 50,, 10. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.
NOTE THAT NOT ALL SCHEDULED THINNINGS WERE POSSIBLE.

Table 5

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 2,, UNDERSTORY,

SITE INDEX 76
THINNING INTENSITY-- INITIAL- 90, SUBSEQUENT- 80,

COLTER-STAND 2

CHARACTERISTICS BEFORE AND AFTER THINNING									PERIODIC INTERMEDIATE CUTS				
STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
50	.2	325	27	3.9	31	450	0	0					
60	.6	322	47	5.2	38	770	230	0					
70	1.0	317	66	6.2	45	1160	640	0					
70	.5	286	58	6.1	44	1000	530	0	31	8	160	110	0
80	1.0	284	85	7.4	50	1560	1170	0					
90	1.4	282	111	8.5	55	2180	1840	1500					
90	.8	179	77	8.9	56	1520	1320	1300	103	34	660	520	200
100	1.2	178	97	10.0	61	2120	1890	3900					
110	2.1	165	109	11.0	64	2570	2340	7200					
110	1.6	115	80	11.3	65	1910	1740	5700	50	29	660	600	1500
120	2.4	106	89	12.4	68	2250	2080	7600					
120	1.5	38	40	13.9	70	1040	980	3900	68	49	1210	1100	3700
130	2.1	36	47	15.5	73	1290	1230	5200					
140	2.7	33	52	17.0	75	1480	1420	6400					
150	3.3	29	54	18.5	78	1600	1540	7400					
							TOTAL YIELDS				4290	3870	12800

MERCH. CU. FT. = TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
BD. FT. = TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.
INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.
DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED = 3.0.
MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.
ALL THINNINGS MAY BE NONCOMMERCIAL.
AT INITIAL AGE 50,, 10. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.

Table 6

YIELDS PER ACRE OF SOUTHWESTERN PONDEROSA PINE, STAND NUMBER 2,, UNDERSTORY,

SITE INDEX 76
THINNING INTENSITY-- INITIAL- 90, SUBSEQUENT- 80,

COLTER-STAND 2

		CHARACTERISTICS BEFORE AND AFTER THINNING							PERIODIC INTERMEDIATE CUTS				
STAND AGE (YEARS)	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	TOTAL VOLUME CU.FT.	MERCHANTABLE VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.
50	.2	325	27	3.9	31	450	0	0					
60	.6	322	47	5.2	38	770	230	0					
70	1.0	317	66	6.2	45	1160	640	0					
70	.8	314	66	6.2	45	1150	630	0	3	0	10	10	0
80	1.2	312	93	7.4	51	1740	1310	0					
90	2.1	287	110	8.4	56	2200	1840	1300					
90	1.5	182	77	8.8	57	1540	1320	1200	105	33	660	520	100
100	2.3	167	89	9.9	61	1970	1760	3400					
110	3.2	147	97	11.0	65	2320	2110	6400					
110	3.2	147	97	11.0	65	2320	2110	6400	0	0	0	0	0
120	4.0	124	97	12.0	68	2470	2280	8200					
120	2.9	40	40	13.6	70	1060	990	3800	84	57	1410	1290	4400
130	3.5	35	44	15.2	73	1210	1150	4800					
140	4.1	30	46	16.8	76	1320	1260	5700					
150	4.7	25	46	18.3	78	1350	1300	6200					
							TOTAL YIELDS				3430	3120	10700

MERCH. CU. FT. = TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
BD. FT. = TREES 10.0 INCHES D.B.H. AND LARGER TO VARIABLE TOP LIMIT.
INITIAL THINNING MUST BE FROM BELOW.
DWARF MISTLETOE RATING ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED = 3.0.
MINIMUM CUTS FOR INCLUSION IN TOTAL YIELDS-- 1. CUBIC FEET AND 1. BOARD FEET.
ALL THINNINGS MAY BE NONCOMMERCIAL.
AT INITIAL AGE 50,, 10. PERCENT OF THE TREES WERE INFECTED WITH DWARF MISTLETOE.
NOTE THAT NOT ALL SCHEDULED THINNINGS WERE POSSIBLE.

*FIN

Table 7

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@DATA,L COLTER2.
DATA 8R1 SL73R1 09/23/77 09:46:19 (1)
     1.       SITE INDEX
     2.       6
     3.       105.,74.,100.,65.,108.,87.,118.,94.,115.,90.,101.,68.
     4.       OVERSTORY
     5.       10
     6.       115.,81.,112.,75.,117.,80.,148.,78.,130.,94.,151.,81.,112.,75.,117
     7.       78.,130.,94.
     8.       UNDERSTORY
     9.       10
    10.       59.,38.,69.,39.,38.,22.,66.,23.,47.,26.,41.,33.,54.,39.,45.,26.,39
    11.       PLOTS
    12.       2,4,0,1.5,2,0,3.5,1,0,4.5,3,0,0.5,1
    13.       2,3,0,12.8,1,0,18.4,1,1,22.0,1
    14.       3,3,0,1.5,2,0,3.5,1,0,13.1,1
    15.       4,5,0,19.8,1,0,13.9,1,0,17.3,1,0,5.5,1,2,2.5,1
    16.       6,5,2,8.3,1,0,20.7,1.1,13.6,1,2,9.3,1,1,14.0,1
    17.       6,1,0,10.6,1
    18.       7,5,1,19.3,1,0,13.4,1,0,15.2,1,0,16.7,1,0,20.5,1
    19.       7,2,1,16.6,1,0,18.8,1
    20.       8,4,0,5.5,1,0,0.5,1,0,16.2,1,1,23.4,1
    21.       10,4,0,0.5,1,0,2.5,1,1,15.5,1,1,8.1,1
    22.       11,3,0,0.5,1,0,1.5,2,2,1.5,1
    23.       11,4,0,27.8,1,0,14.2,1,1,17.4,1,0,7.2,1
    24.       12,4,0,20.8,1,0,21.8,1,0,33.8,1,1,19.8,1
    25.       13,2,0,9.3,1,0,12.9,1
    26.       14,4,0,5.5,5,0,4.5,1,0,1.5,1,0,3.5,1
    27.       14,5,0,9.6,1,0,6.7,1,0,13.5,1,0,7.0,1,0,7.6,1
    28.       14,2,0,22.1,1,0,23.8,1
    29.       15,5,0,5.5,1,0,6.1,1,0,12.1,1,0,24.0,1,0,9.8,1
    30.       16,3,0,1.5,1,0,0.5,1,0,13.0,1
    31.       16,5,0,12.2,1,1,15.0,1,0,18.1,1,1,11.6,1,0,18.2,1
    32.       17,3,0,0.5,4,0,20.5,1,0,25.9,1
    33.       19,4,0,4.5,2,0,3.5,5,0,0.5,1,0,5.5,1
    34.       19,4,0,14.2,1,0,21.2,1,1,19.5,1,1,23.1,1
    35.       20,5,0,19.0,1,0,18.7,1,0,14.9,1,0,24.6,1,0,10.8,1
    36.       20,2,0,27.7,1,0,30.0,1
    37.       21,5,0,0.5,2,0,4.5,1,0,1.5,1,1,4.5,1,1,3.5,1
    38.       21,2,1,10.1,1,1,16.2,1
    39.       22,1,1,2.5,1
    40.       23,5,1,17.3,1,0,8.3,1,1,10.1,1,1,10.6,1,1,18.3,1
    41.       23,3,1,13.2,1,1,17.9,1,0,19.4,1
    42.       24,5,1,1.5,1,0,1.5,2,0,0.5,4,2,3.5,1,1,0.5,1
    43.       24,5,0,2.5,1,1,19.5,1,0,22.9,1,0,22.7,1,1,25.3,1
    44.       25,2,0,12.7,1,0,7.4,1
    45.       26,5,0,1.5,4,0,4.5,2,1,5.5,1,1,2.5,3,1,4.5,1
    46.       26,4,1,3.5,1,0,0.5,3,0,2.5,1,1,10.9,1
    47.       27,4,0,20.4,1,1,24.7,1,1,21.3,1,0,20.8,1
    48.       28,5,1,22.1,1,1,10.2,1,0,19.1,1,1,15.8,1,1,19.4,1
    49.       28,3,1,14.3,1,1,12.0,1,0,13.1,1
    50.       29,5,0,0.5,1,1,25.8,1,1,23.0,1,1,22.5,1,0,25.5,1
    51.       30,3,0,1.5,1,0,4.5,1,1,27.5,1
    52.       30,5,0,7.6,1,0,7.2,1,0,8.7,1,0,8.5,1,0,7.4,1
    53.       31,4,0,4.5,1,0,5.5,1,0,9.1,1,1,7.8,1
    54.       31,5,1,22.3,1,0,6.7,1,2,23.7,1,0,13.8,1,0,22.2,1
    55.       33,2,0,10.4,1,0,7.6,1
```

ENTER FOREST NAME

IS THIS RIGHT? - APACHE / SITGREAVES ENTER Y OR N

ENTER DISTRICT NAME

IS THIS RIGHT? - ALPINE ENTER Y OR N

ENTER STAND NUMBER

IS THIS RIGHT? - 2 ENTER Y OR N

ENTER STAND NAME

IS THIS RIGHT? - COLTER TSI ENTER Y OR N

ENTER STAND LOCATION

IS THIS RIGHT? - SOUTH OF USFS ROAD 88B ENTER Y OR N

ENTER SURVEY INFO

IS THIS RIGHT? - FIDM, 1977 ENTER Y OR N

ENTER ACRES, NO. OF PLOTS, BAF, ACRES/FIXED PLOT
MAXIMUM UNDERSTORY DIAMETER

IS THIS RIGHT? - 600.0 60. 20. .010 8.9 ENTER Y OR N

APACHE / SITGREAVES N.F. ALPINE R.D.

STAND NO. 2 COLTER TSI

LOCATION SOUTH OF USFS ROAD 88B

SURVEY FIDM, 1977

600.0 ACRES 60. PLOTS 20. BAF .010 ACRES/FIXED PLOT

MEYER'S SITE INDEX

AGE	HEIGHT	SITE INDEX
105.	74.	72.0
100.	65.	65.0
108.	87.	83.5
118.	94.	85.8
115.	90.	83.5
101.	68.	67.6

AVERAGE SITE INDEX 76.2

OVERSTORY(1)

DOMINANT AND CODOMINANT TREES

	AGE	HEIGHT
	115.	81.
	112.	75.
	117.	80.
	148.	78.
	130.	94.
	151.	81.
	112.	75.
	117.	80.
	148.	78.
	130.	94.
AVERAGE	128.0	81.6

UNDERSTORY(2) POTENTIAL

DOMINANT AND CODOMINANT TREES

	AGE	HEIGHT
	59.	38.
	69.	39.
	38.	22.
	66.	23.
	47.	26.
	41.	33.
	54.	39.
	45.	26.
	39.	35.
	43.	29.
AVERAGE	50.1	31.0

NUMBER OF LIVE TREES PER ACRE

DIAMETER CLASS	DM INFECT	TOTAL PINE	% OF PINE INFECTED	OTHER COMMER. SPECIES	TOTAL STAND	% OF STAND IS PINE
.1- .9	1.67	56.67	2.94	3.33	60.00	94.44
1.0- 1.9	1.67	63.33	2.63	5.00	68.33	92.68
2.0- 2.9	8.33	35.00	23.81	1.67	36.67	95.45
3.0- 3.9	8.33	41.67	20.00	1.67	43.33	96.15
4.0- 4.9	5.00	45.00	11.11	.00	45.00	100.00
5.0- 5.9	3.33	35.00	9.52	.00	35.00	100.00
6.0- 6.9	.00	11.57	.00	.00	11.57	100.00
7.0- 7.9	1.09	11.95	9.09	.00	11.95	100.00
8.0- 8.9	2.54	11.84	21.43	1.69	13.53	87.50
9.0- 9.9	.00	3.39	.00	.68	4.06	83.33
10.0-10.9	2.77	6.65	41.67	.00	6.65	100.00
11.0-11.9	.92	.92	100.00	.00	.92	100.00
12.0-12.9	.78	5.08	15.38	.39	5.48	92.86
13.0-13.9	1.34	4.69	28.57	.00	4.69	100.00
14.0-14.9	.58	3.49	16.67	.00	3.49	100.00
15.0-15.9	.76	1.53	50.00	.00	1.53	100.00
16.0-16.9	.67	1.80	37.50	.00	1.80	100.00
17.0-17.9	.80	1.40	57.14	.00	1.40	100.00
18.0-18.9	.18	1.61	11.11	.00	1.61	100.00
19.0-19.9	1.13	1.93	58.33	.00	1.93	100.00
20.0-20.9	.29	1.31	22.22	.00	1.31	100.00
21.0-21.9	.66	1.19	55.56	.00	1.19	100.00
22.0-22.9	.85	1.69	50.00	.00	1.69	100.00
23.0-23.9	.55	.77	71.43	.11	.89	87.50
24.0-24.9	.20	.41	50.00	.00	.41	100.00
25.0-25.9	.28	.56	50.00	.00	.56	100.00
26.0-26.9	.09	.17	50.00	.00	.17	100.00
27.0-27.9	.16	.40	40.00	.00	.40	100.00
28.0-28.9	.08	.08	100.00	.00	.08	100.00
30.0-30.9	.00	.33	.00	.00	.33	100.00
33.0-33.9	.00	.05	.00	.00	.05	100.00
TOTALS						
.1-33.9	45.06	351.49	12.82	14.54	366.03	96.03
UNDERSTORY(2)						
.1- 8.9	31.96	312.03	10.24	13.36	325.39	95.89
OVERSTORY(1)						
9.0-33.9	13.10	39.46	33.20	1.18	40.63	97.10

SQ. FT. OF BASAL AREA PER ACRE

DIAMETER CLASS	DM INFECT	TOTAL PINE	% OF PINE INFECTED	OTHER COMMER. SPECIES	TOTAL STAND	% OF STAND IS PINE
.1- .9	.00	.08	2.94	.00	.08	94.44
1.0- 1.9	.02	.78	2.63	.06	.84	92.68
2.0- 2.9	.28	1.19	23.81	.06	1.25	95.45
3.0- 3.9	.56	2.78	20.00	.11	2.90	96.15
4.0- 4.9	.55	4.97	11.11	.00	4.97	100.00
5.0- 5.9	.55	5.77	9.52	.00	5.77	100.00
6.0- 6.9	.00	2.67	.00	.00	2.67	100.00
7.0- 7.9	.33	3.67	9.09	.00	3.67	100.00
8.0- 8.9	1.00	4.67	21.43	.67	5.33	87.50
9.0- 9.9	.00	1.67	.00	.33	2.00	83.33
10.0-10.9	1.67	4.00	41.67	.00	4.00	100.00
11.0-11.9	.67	.67	100.00	.00	.67	100.00
12.0-12.9	.67	4.33	15.38	.33	4.67	92.86
13.0-13.9	1.33	4.67	28.57	.00	4.67	100.00
14.0-14.9	.67	4.00	16.67	.00	4.00	100.00
15.0-15.9	1.00	2.00	50.00	.00	2.00	100.00
16.0-16.9	1.00	2.67	37.50	.00	2.67	100.00
17.0-17.9	1.33	2.33	57.14	.00	2.33	100.00
18.0-18.9	.33	3.00	11.11	.00	3.00	100.00
19.0-19.9	2.33	4.00	58.33	.00	4.00	100.00
20.0-20.9	.67	3.00	22.22	.00	3.00	100.00
21.0-21.9	1.67	3.00	55.56	.00	3.00	100.00
22.0-22.9	2.33	4.67	50.00	.00	4.67	100.00
23.0-23.9	1.67	2.33	71.43	.33	2.67	87.50
24.0-24.9	.67	1.33	50.00	.00	1.33	100.00
25.0-25.9	1.00	2.00	50.00	.00	2.00	100.00
26.0-26.9	.33	.67	50.00	.00	.67	100.00
27.0-27.9	.67	1.67	40.00	.00	1.67	100.00
28.0-28.9	.33	.33	100.00	.00	.33	100.00
30.0-30.9	.00	1.67	.00	.00	1.67	100.00
33.0-33.9	.00	.33	.00	.00	.33	100.00
TOTALS .1-33.9	23.63	80.91	29.21	1.90	82.81	97.70
UNDERSTORY(2) .1- 8.9	3.30	26.58	12.41	.90	27.48	96.72
OVERSTORY(1) 9.0-33.9	20.33	54.33	37.42	1.00	55.33	98.19

STAND CONDITIONS

AVG SITE INDEX 76.2

OVERSTORY(1)

TREES 9.0 TO 33.9 IN. D.B.H.
CURRENT GROWING STOCK LEVEL 55.3

STAND AGE (YEARS)	AVG D.B.H. IN.	AVG HEIGHT FT.	TREES NO.	DMR	PER CENT INFECTED	START
128.	15.8	81.6	40.6	.0	33.2	.0

UNDERSTORY(2)

TREES 4.5 FT. TALL TO 8.9 IN. D.B.H.
CURRENT GROWING STOCK LEVEL 63.7

STAND AGE (YEARS)	AVG D.B.H. IN.	AVG HEIGHT FT.	TREES NO.	DMR	PER CENT INFECTED	START
50.	3.9	31.0	325.4	.0	10.2	.0